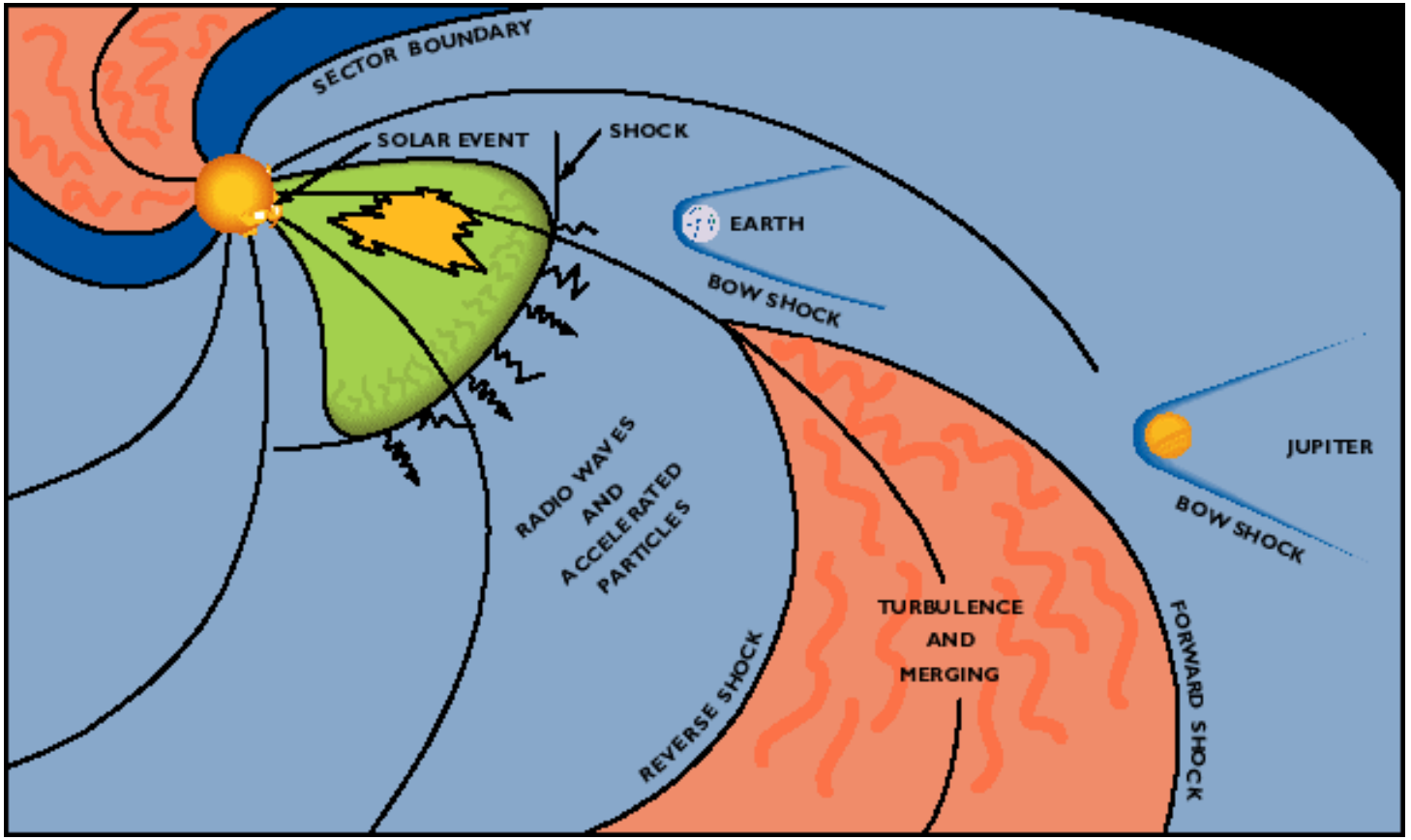
Sentinels


SECTOR BOUNDARY
SOLAR EVENT
SHOCK
EARTH
BOW SHOCK
JUPITER
BOW SHOCK
RADIO WAVES AND ACCELERATED PARTICLES
TURBULENCE AND MERGING
REVERSE SHOCK
FORWARD SHOCK

Sentinels Mission Goals and Objectives

The heliosphere is very inhomogeneous. Therefore, the propagation of transients is not uniform and they could significantly evolve before reaching Earth. To improve accuracy of space weather predictions, the Sentinels mission will characterize the environment through which solar disturbances propagate and study their evolution.

Sentinels will plan to:

- Provide global characterization of the heliosphere leading to improved accuracy of transient propagation models
- Resolve geo-effective solar wind structures in order to map them back to solar features enabling future long-term predictions
- Search for the location and mechanism of energetic-particle acceleration leading to prediction of such phenomena
- Provide tomographic images of the Sun
- Increase the lead time and accuracy for geospace forecasts

Sentinels Major Science Questions

The Sentinels mission will address the following major science questions:

- What is the three-dimensional structure of the heliosphere near the ecliptic?
- How do large-scale structures evolve during transit to Earth?
- What solar dynamic processes are responsible for the release of geo-effective events?
- How and where are energetic particles released and accelerated?
- What is the origin and nature of the solar dynamo?
- How do active regions evolve?
- What is the mechanism of ejection of mass and energy from the Sun?

Sentinels Approach/Methodology

The Sentinels mission will make the following coordinated measurements:

- *In-situ* observations of the heliospheric vector magnetic field, solar wind plasma bulk properties and composition, and high-energy particles to characterize the medium and the transients traveling within it
- Remote sensing of the propagation of interplanetary shock with radio burst tracking
- EUV imaging of the solar corona to follow the evolution of active regions (in conjunction with SDO)
- Photospheric and coronal magnetic fields with a Doppler-Magnetograph and radio occultation in order to identify the birthplace of transients (in conjunction with SDO)
- Helioseismology to follow the development of structures within the Sun (in conjunction with SDO)

Sentinels Mission Description

The Sentinels mission will have three distinct elements:

- Four Inner Heliospheric Sentinels (IHS) in heliocentric orbits ranging from 0.5 to 0.95 AUs.
- A Far Side Sentinel (FSS) in a 1-AU orbit nearly out of phase with Earth on the far side of the Sun.

These elements will work together as part of the LWS system to track solar disturbances as they evolve and transit the heliosphere to Earth.

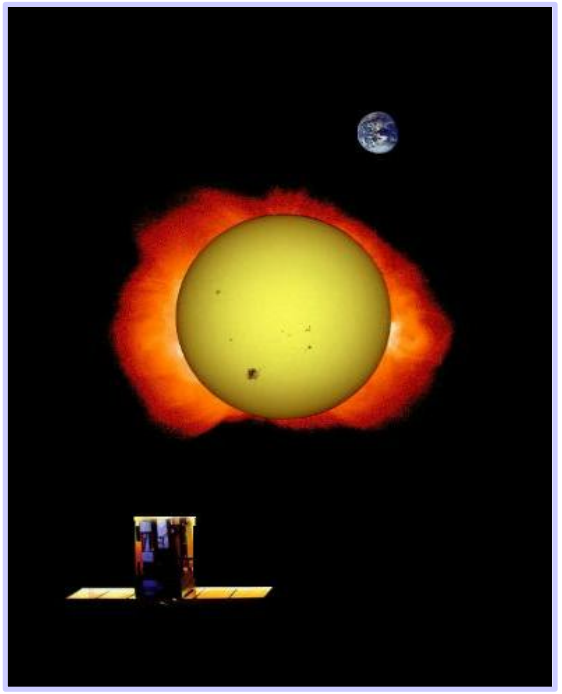
Sentinels Mission Characteristics/FSS

- FSS is a three-axis stabilized spacecraft in a 1-AU heliocentric orbit slowly drifting from 180 to 120 degrees separation from Earth.

- Remote sensing will supplement SDO observations to provide continuous and whole surface imaging of the photosphere and solar corona, hence allowing the study of evolution of solar active regions.

- The on-board Doppler-Magnetograph will enable solar seismology to be carried out in conjunction with SDO to determine the inner structure of the Sun.

- FSS will carry a full complement of *in-situ* instrumentation to provide a key vantage point for the determination of inner heliospheric structures in cooperation with the other Sentinels.



Sentinels Mission Characteristics/IHS

Inner Heliospheric Sentinels (IHS)

- Four spinning satellites in heliocentric orbits covering radial distances between 0.5 and 0.95 AUs.

  in-situ instrumentation to determine the ambient structure of the inner heliosphere and follow the evolution of large-scale features. Data from the IHS will be supplemented by the *in-situ* observations of FSS and near-Earth assets along with remote sensing observations from SDO and FSS.